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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/679,799	10/06/2003	Susan W. Zogbi	090936.0532	3698

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EXAMINER	
TOWA, RENE T	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/679,799	Applicant(s) ZOGBI ET AL.	
	Examiner Rene Towa	Art Unit 3736	

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 October 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. This Office action is responsive to an amendment filed October 2, 2007. Claims 1-24 are pending. Claims 1, 14 and 23 have been amended. No claim has been added or cancelled.

Claim Rejections - 35 USC § 103

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. **Claims 1-2, 10-11, 14-15 and 21-24** are rejected under 35 U.S.C. 103(a) as being unpatentable over Mendes et al. (US 6,245,109) in view of Young (US 3,756,081).

In regard to **claim 1**, Mendes et al. disclose(s) a system (see figs. 2-7) for a performing a remote measurement of the displacement between two adjacent objects (24, 28), comprising:

a pair of sensors (34, 36), wherein one of the sensors 34 includes magnetic rod fixed within a sensor coil, such that the rod does not move relative to the coil (see col. 8, lines 62-67; col. 9, lines 1-7;

wherein said sensor 34 is operable to form a tuned circuit; and

an interrogator 40 having a transmit coil and at least one receive coil , transmit circuitry for delivering to the sensor coil an excitation signal through a range of frequencies, and receive circuitry for receiving a response signal from the sensor coil (see col. 9, lines 48-58 & 67; col. 10, lines 1-16);

wherein the interrogator is operable to detect a peak frequency from the sensor when the sensors are placed substantially parallel, but not attached to, each other in an environment where displacement is to be measured (see col. 7, lines 1-12; col. 9, lines 15-30).

In regard to **claim 2**, Mendes et al. disclose(s) a system further comprising means for electrically resonating said coil (see col. 9, lines 48-58 & 67; col. 10, lines 1-16).

In regard to **claim 11**, Mendes et al. disclose(s) a system wherein the interrogator 40 has digital processing circuitry (via a microprocessor 54) for processing the received signal (see col. 10, lines 1-16).

In regard to **claims 14 & 23**, Mendes et al. disclose(s) a method for determining displacement between two objects (24, 28), comprising the steps of:

attaching a first sensor 34 to a first location 24;

attaching a second sensor 36 to a second location 28;

wherein one of the sensors has a rod, a coil, and a capacitor, electrically connected such that the rod, the sensor coil, and the capacitor form a tuned circuit (see col. 7, lines 1-12; col. 8, lines 62-67; col. 9, lines 1-7);

interrogating a sensor with an interrogation signal; and

receiving a response signal from said sensors; and

calculating the distance between the steps based on the receiving step (see figs. 2-7; col. 7, lines 1-12; col. 9, lines 15-30, 48-58 & 67; col. 10, lines 1-16).

In regard to **claim 15**, Mendes et al. disclose(s) a method wherein the sensors (34, 36) are attached by being embedded within a living body (see figs. 2-7).

In regard to **claim 22**, Mendes et al. disclose(s) a method wherein said sensor 34 is self-resonating in response to the interrogation step (see col. 8, lines 62-67).

Mendes et al. discloses a system, as described above, that fails to explicitly teach a system comprising a mixer, wherein a pair of sensors have substantially the same resonant frequency.

However, in regards to **claims 1 & 10**, Young discloses a system wherein the sensors have substantially the same resonant frequency and a mixer 13 to detect a shift in the peak frequencies thereof and to determine distance between the sensors based on the shift (see fig. 1; column 1/lines 7-32, 51-58 & 61-67; column 2/lines 3-8 & 25-36; column 3/lines 7-12).

In regard to **claims 14 & 23**, Young disclose(s) a method for determining displacement between two objects, comprising the steps of:

attaching a first sensor to a first location;

attaching a second sensor to a second location, such that the second sensor is substantially parallel to the first sensor;

wherein each sensor has a rod (9,10), a coil (7,8), and a capacitor (5, 6), electrically connected such that the rod (9,10), the sensor coil (7,8), and the capacitor (5,6) form a tuned circuit, wherein the rod is fixed within the coil such that the rod odes not move relative to the coil;

receiving a pair of peak frequencies that indicate the motion of the sensors relative to each other;

calculating the distance between the sensors, based on the receiving step (see fig. 1; column 1/lines 7-32, 51-58 & 61-67; column 2/lines 3-8 & 67-68; column 3/lines 1-3 & 7-12).

In regard to **claim 21**, Young disclose(s) a method further comprising the step of creating an electrical resonance of each sensor, such that the response signal has a pair of resonant frequencies (see column 1/lines 15-32).

In regards to **claims 1, 14 & 23**, Mendes et al. teach a system wherein a resonant circuit 34 is tuned by a magnetic material 36 such that varying the distance between the resonant circuit 34 and the tuning material 36 produces a distance-dependent change in frequency (see col. 7, lines 1-12); since it is known that replacing the tuning magnetic material 34 with another resonant circuit would allow the system to function in a similar way (see US 4,593,703, col. 5, lines 49-56; col. 7, lines 50-57; col. 8, lines 1-17), it would have been obvious to one of ordinary skill in the art at the time Applicant's invention was made to modify a system similar to that of Mendes et al. to include a second resonant circuit similar to that of Mendes et al. in order to achieve a system wherein a resonant circuit is tuned by another resonant circuit such that varying the distance between the two resonant circuits produces a distance-dependent change in frequency.

Moreover, in regards to **claims 1, 14, 21 & 23,** both Mendes, as modified above, and Young teach systems for measuring a displacement wherein the frequency of one

resonant-circuit is increased while that of the other is decreased; since Young additionally teaches that such a displacement is advantageously measured by separately measuring and analyzing signals from two substantially identical resonant circuits of like resonant frequency arranged in such a way that the frequency of one resonant-circuit is increased while that of the other is decreased so that twice the frequency change occurs when comparing the frequency of one resonant circuit with that of the other (see fig. 5; col. 1, lines 7-32 & 50-66; col. 2, lines 49-66), it would have been obvious to one of ordinary skill in the art at the time Applicant's invention was made to modify a method similar to that of Mendes et al., as modified above, to include a pair of like resonant sensors as taught by Young in order to achieve a differential measurement of the displacement so as to enable a measurement of twice the sensitivity to be obtained with a degree of self compensation in relation to changes of temperature and characteristics (see column 2/lines 67-68; column 3/lines 1-3).

Similarly, in regards to **claim 10**, it would have been obvious to one of ordinary skill in the art at the time Applicant's invention was made to modify a method similar to that of Mendes et al. as modified by Young above, to include a mixer as taught by Young in order to detect a shift in the peak frequencies thereof.

In regard to **claim 24**, since Mendes et al. teach a system comprising sensors that are attachable to a subject's articulating bones to measure a displacement between the bones to estimate the degree of wear between articulating bones (see col. 7, lines 34-60), it would have been obvious to one of ordinary skill in the art at the time Applicant' invention was made to modify a system similar to that of Mendes et al. as modified by

Young, above, to measure a displacement of portions of a spine in order to determine a wear of the surfaces between the bones (i.e. perhaps after cartilage or spinal disk replacement).

4. **Claims 3 & 16** are rejected under 35 U.S.C. 103(a) as being unpatentable over Mendes et al. ('109) in view of Young ('081) in view of Hansen (US 4,618,822).

Mendes et al. as modified by Young discloses a system, as described above, that fails to explicitly teach at least one end mount operable to be attached to one of the objects.

Mendes et al. disclose(s) a system comprising a pair of sensors (10, 110; 10', 110'), each sensor (10, 110, 10', 110') having a magnetic rod 11, a sensor coil 13 and capacitor 15; wherein each sensor is attached by means of an end mount (17, 19) at one end of each sensor 10 to a skeletal object (see fig. 1).

Since Mendes et al. and Hansen teach sensors that are attachable to a subject's bones to measure a displacement of the bones, it would have been obvious to one of ordinary sill in the art at the time Applicant' invention was made to provide a system similar to that of Mendes et al. as modified by Young, above, with an end mount similar to that of Hansen in order to attach the sensors to the bones.

5. **Claims 4-6, 13, & 17-19** are rejected under 35 U.S.C. 103(a) as being unpatentable over Mendes et al. ('109) in view of Young ('081) further in view of Shimizu et al. (US 4,556,886).

In regards to **claims 4-6 & 17-19**, Mendes et al. as modified by Young discloses a system, as described above, that fails to teach transmit and receive coils in a nulling

geometry. However, Shimizu et al. teach several embodiment of at least one transmit coil (4A-B; 76-77) and at least one receive coil (5; 72-75) configured in a nulling geometry (see figs. 2, 14 & 17; column 2/lines 65-68; column 3/lines 1-15; column 4/lines 14-23 & 31-40; column 6/lines 13-16; column 10/lines 62-66; column 11/lines 29-37). It would have been obvious to one of ordinary skill in the art at the time Applicant's invention was made to provide a system similar to that of Mendes et al. as modified by Young with transmit and receive coil geometries similar to that of Shimizu et al. in order to obtain the displacement by measuring the phase difference, that has been initialized at zero phase, between the transmit and receive coils (see Shimizu et al, column 4/lines 31-40).

In regards to **claim 13**, Mendes et al. as modified by Young discloses a system, as described above, that fails to teach means for adjusting the resonance of the sensor. However, Shimizu et al. disclose a system comprising means 11 for adjusting the resonance of a sensor 1 (see fig. 7; column 7/lines 34-38 & 48-53). It would have been obvious to one of ordinary skill in the art at the time Applicant's invention was made to provide a system similar to that of Mendes et al. as modified by Young with a means for adjusting the resonance of the sensor similar to that of Shimizu et al. in order to cancel the phase difference errors due to mounting (see Shimizu et al., column 7/lines 54-60).

6. **Claims 7-9 & 20** are rejected under 35 U.S.C. 103(a) as being unpatentable over Mendes et al. ('109) in view of Young ('081) further in view of Bullara (US 4,127,110).

Mendes et al. as modified by Young discloses a system, as described above, that fails to explicitly teach sensors that are encased in a flexible sheath.

However, Bullara discloses a system wherein the sensor is enclosed in a biocompatible flexible sheath 29 (see fig. 2; column 3/lines 41-44 & 48-56; column 4/lines 38-40; column 5/lines 21-31).

It would have been obvious to one of ordinary skill in the art at the time Applicant's invention was made to provide a system similar to that of Mendes et al. as modified by Young with biocompatible sensor encasings similar to that of Bullara in order to provide a housing structure that is not biologically reactive as it is well-known in the art. Moreover, it would have been obvious to one of ordinary skill in the art at the time Applicant's invention was made to provide a system similar to that of Mendes et al. as modified by Young as further modified by Bullara with sensors made or coated with a biocompatible material since such a modification would serve the same function of providing sensors that are not biologically reactive.

7. **Claim 12** is rejected under 35 U.S.C. 103(a) as being unpatentable over Mendes et al. ('109) in view of Young ('081) further in view of Aronow et al. (US 3,628,381).

Mendes et al. as modified by Young discloses a system, as described above, that fails to explicitly teach a mutual inductance bridge.

However, Aronow et al. disclose a system comprising a mutual inductance bridge connected to a coil 11 (see fig. 1).

It would have been obvious to one of ordinary skill in the art at the time Applicant's invention was made to provide a system similar to that of Mendes et al. as modified by Young with an inductance bridge similar to that of Aronow et al. in order to

compensate for the temperature deviations in the coil (see Aronow et al., column 3/lines 26-45).

Response to Arguments

8. Applicant's arguments filed October 2, 2007 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

US 4,593,703 to Cosman discloses a telemetric differential pressure sensor with the improvement of conductive shorted loop tuning element and a resonant circuit.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rene Towa whose telephone number is (571) 272-8758. The examiner can normally be reached on M-F, 8:00-16:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Max Hindenburg can be reached on (571) 272-4726. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/RTT/